AN INAUGURAL DISSERTATION
ON

Physiology of Nutrition

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BY

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In consideration of the high esteem entertained for each member of the Medical Faculty of Nashville University, this humble dissertation is dedicated, or inscribed to them collectively, for their kindness is fondly remembered by their pupil and friend.

The Author.
Physiology of Nutrition.

A dissertation upon this subject involves a consideration of the following divisions, viz—


Each of these divisions will be subdivided as they come up for our discussion.

First. Food, divided into 1st. Vegetable, 2d. Animal.

So rare the sable curtain had flew, and time itself been born—Light was but severed from dark—Help! the chaotic mass but merged into earth's form.

The morning stars but tuned their lyres! So rare had the shouts of the sons of god echoed, and died away, in the distance!—When Lo! the man is made, a green herbiferous carpet is thrown broadcast, and the
face of the unchristened Earth, as if to form a pleas-
and receptacle, for the primeval food of Man;
And from whose spontaneous luxuries he might sat-
iate his desires for food.

But alas! Some moral Hydrogenic was eaten, so-
long Man had lived in his Edenic Paradise, And now
lamentable as it is, by the devours of his face he calls,
for his consumption, The nutrititious vegetable from
the poisonous, And in sorrow-close to this, because
that light has grown dim which principally shines
in benefactive lustre, discriminating in perfection,
between The nutritious and Tonicological, if indeed,
The latter existed at all.

Although the Curtain of human depravation has
fallen thus in saecup around us, Still there is a
ray of light shining forth in the Vegetable King-
dom, as seen in its germination, growth, and adapta-
tion to the wants of Man, as a nutriment and also
as an aid to his bio-Medicalin-Nature in Repair-
ing his earthly bane when torn by the tempests of
time, all of which, light reflects glory upon the
creator, and illumines the path of man to hope, at
least for analgesics, amidst the torturing pains in life,
and for food, the antidote of innanition.

The abstract germ of the plant, and of man
when seen by aid of microscope, or physiologically
examined, seem to differ very little in many respects.
Indeed, their elementary principles may be the same,
but joined together by the laws of affinity, in differ-
ent proportions. And as affinity is a law allowing com-
pounds in different proportions, thus though the elements
be the same, these different proportions prevailing the
one germinates into a plant, and the other into a
man. The one requiring but the fertile earth into
which to be imbebed, then warmed by the genial ray
of the sun, and watered by the rains of heaven to cause
it to spring up, and after its durt, it breathes the at-
mosphere around, and thus it grows and becomes
food for man. While the other is down in an or-
gan capable of the highest physiological functions.
and around it are formed specially nourishing and pro-

fecting membranes. Then from the blood of the Mother
it gains its nutriment, even as the plants beneath the
surfaces gain their nourishment from the strength of
the soil. When the plant springs forth, it has the aid
of the atmosphere to nourish it, then it grows by
means of soil, refreshing of air, and water by means
of rain. So when the original germ of Man, quite
lifeless in Utero, it comes forth, the more in direct contact
with the atmosphere, inhaling it, for creation of its
own blood, upon which it is now dependent, for
its earthly existence, and this blood is sustained
by the food eaten.

Thus we see the Comparative analogy existing
between the growth of these different germs.

But the plant has the power of converting atmos-
phere into food, in this it differs from Man, and
also in the fact that, that part, which is nutritious
in plants, if taken separately is poisonous in Man.
Yet this quality is so changed in many plants, by it,
affinity for other constituents of the plant, as not to be poisonous, but highly nutritious and pleasant to man.

Now the effete matter of man, is being constantly cast off, by the various eminences. And this effete matter is such as has been vitalized, or else it is of such material as not to be vitalized at all, and if it be of the first named kind it has performed its office in the body, and is exhausted, and is removed by the lymphatics, and its vacancy must be speedily filled from the capillaries, or else soon death will take place from innutrition.

Since as we have seen, there is such likeness in many respects, between vegetable and animal, what could be better than a vegetable diet? It is very soon vitalized, and thus becomes a part of the living economy. All things shew forth the handy work of the all-wise Creator!

Thus the physiology of man demonstrates, that he is continually giving off, old, and taking on new particles. Now if this be conceded, I conclude that there...
are fewer particles exhaled in youth, and thus the
system enlarges its dimensions. In middle life, that
which is received, and given off, are equal; hence
permanency in stature, and strength. But in age,
the effete matter is greater than the newly vitalized,
hence the system deteriorates, instead of strengthen-
ing, and beautifying, as in youth.

Some of the nutritious principles of plants, are their
Dextrose, Saccharine, Albumen.

A wise providence is manifest in the fact, that
everywhere on earth, designed, for man to live,
vegetables either grow spontaneously, or by the heat
of the sun, may be made to grow, or if indeed, this
fail, then commerce comes to his aid, for the labor,
and blessings, of which, we are dependent on the
same almighty, who is the giver, of every good
and perfect gift.

And further, there is admirable appropriateness
in the creative arrangement. For in the tropics where
men are exulted by heat of a vertical sun, systems too
can for much labor, these foods, is more readily obtained, and less labor is required to prepare it, as is shown by the Bread Fruit Tree, growing its ready made loaves! While in the more temperate zones, more labor is requisite, not only in its culture, but also in its preparation. The seasons are also shorter, but kind providence hastens the ripening. At the same time the muscular fibre of man is more contractile, and strong, and therefore the more capable of the toil requisite in the culture, and preparation of this food. In tropical zones, the inhabitants, are adapted to the climate.

D Animal Food. These are but few, if any, animals, which do not live upon vegetable food, or upon other animals. There are some intermediate links between vegetable, and animal, which do not exist thus, but as we vegetables, principally from air and earth. Some animals are herbivorous, some carnivorous, others omnivorous, as man (so) living by either vegetable or animal, one, or both.
The teeth and the arrangement of the teeth are different, in the different tribes, of the animal kingdom. Which is a mark of creative distinction, not void of wise designs, which if fathomed, then the handy work of him, who makest means adapted to their end. You indeed! In the ephemeral insect, fleeting gladly, but for a day, in the beams, of the summer's sun, his praise is magnificently shewn forth. And thought-lep indeed, must be the man (not to say winklep) who needlessly tramps, beneath his feet, even the worm of the dust, or the busy ant, for they too, are creatures of God. And though in them the vulgar see no charm, yet to the eye, from which the scales of sin and ignorance have fallen, they are mirrors, reflecting the power and wisdom of him, who made them, and us! May truly! To the properly educated mind, there is not a spring of grass, in the desert oasis, wild, nor a flower, that flows, upon the mountain top, nor in the valley low, but that shews forth, the power, wisdom, and praise of God. But we earthly despisers,
That animal food, was eaten, by our first parents, I think, is quite probable. Their first clothing, prepared by God himself, was of skins of beasts. Which beasts were most likely plain for the compound purpose, of food, and the rite of sacrifice. That it was eaten, more or less regularly before the flood, is a point clearly sustained, And your own peculiar nation, the Jews, ate it by this initiation, though in a restricted sense, which fact typified the fury of God upon people.

There is a more thorough concentration of fibris, in animal, than in vegetable food. The fibris, of the lower order of animals, is more nearly like that of man, than is the vegetable fibris, which is proof, a part of its preferable character, for food. In many instances, herbivorous animals which become food for man, are refining mills, of fibrous matter, from vegetation, that is may truly be vitalized, in man, and conform to the uses, of his economy. That animal food, more speedily replenishes an exhausted system, and maintains, its sinking powers.
No doubt, hence the frequent prescription of Beef-
Tea, when the system languishes from continual fever.

When we consider the entire dependence of the an-
imal, upon the vegetable kingdom, either directly, or
indirectly, we are at the ulterior, left, as our only
resource abstractly, dependent upon that simple,
yet complicated vegetable germ, whose analogy,
we have shown, as beautifully existing, with the
material germ of Man. But-

Secondly, We are to consider, the subject of
Digestion, divided into 1st. Prehension, 2nd Max-
ipation, 3rd. Deglutition, 4th Chymeepitation,
5th. Chyleepitation.

1st. Of Prehension. In the great deluge,
The waters, covered the highest mountains, to the depth,
of fifteen Cubits, and all vegetable, and animal
food, provide equally plentifuls, and of the most,
luxuriant character, without prehension, it
would not do, man a particle of good.

prehension may be simply defined, as the mother-
opportunity of bringing food into the mouth.

This power exists, more or less, perfect in all orders of animals, even the Mammalia, Articulata, and Mollusca, all exhibit it, but true, to a far greater extent, than man. But of what has vain man to boast? When without prehension, he must die! And so! The Polypus, scarce above the plants in rank of existence, has prehension too!

But, how is prehension accomplished? Simple question, it may seem, but not so simple, to the answer thereto. To accomplish this, the requisites are: The bones of the arm, with their thoracic articulation, their articulation with themselves, and with the carpal bones, and these with the meta-carpal, and yet, the phalangeal articulations, all of these with the deltoideus, biceps, and extensor muscle of the arm, with the various muscles of forearm and hand, with blood vessels, nerves, integument, and even the unguis, all these, and yet more. For this might exist, and yet, the limb be paralyzed,
There must exist a brain, a centre of nervous influence, - the Throne of the Mind. To this throne enthroned, must be made known, the necessities of the body, through the media of the reflex nerves of the stomach. By this, we have the sense of hunger. When this intelligence is thus made known to the mind, as a Monarch it sends, its edict, through the media of the Motory Nerve, to the arms, and demands, effectual motion. And these as true subjects, speedily obey, and Obsequious! Is the result, how complicated, and yet curiously viewed, how simple!

II. Mastication and Insalivation.

For the accomplishment, of the important office of Mastication, the superior and inferior Maxillaries, are brought into requisition, having set within their alveolar processes, thirty-two teeth. They being brought into the mouth, by prehension, as just described, then the Mind wills its Mastication, and calls upon the Motory Nerves of the face, (trunks of 7th pair)
and in obedience to this acquisition, at once, the Masseter, Buccinator, Temporal, Lingual, Pterygoïd and Digastric muscles, are engaged moving the jaws, in various ways, and with considerable force, for the grinding, of the food, of the food.

Situated in the glenoid cavity, partly, and adjacent parts, on either side, and at or near, the articulation of the inferior Maxillary, are the Parotid glands, and from these, on both sides, passes the duct of Stens, and in such connection, to the Masseter, and Buccinator muscles, as that their movements, in the act of chewing ye, is constantly pressing the salivary secretions, of these glands, through these ducts, into the mouth. Also the submaxillary glands situate, at the angle of the lower jaw, on both sides, having an entrance into the mouth, through the duct of Wharton, with the two sublingual glands, beneath the tongue, having each 10 or 12 ducts, of Rivinani. They also emptying, their secretion, into the mouth, by the movements, of the nerves and muscles, hence as
Mastication, goes on, insalivation likewise takes place; for the double purpose, of moistening, and thereby lubricating the food; and of forming a chemical combination, for the promotion of digestion in the stomach.

By the increase of muscular action in masticating, there is an enlarged quantity of those, invited to these six glands, and from this increase, of blood, an increase of saliva, is secreted, just as needed, for mixture, during Mastication, and while it has so much physiological work to perform, preparatory to deglutition, and digestion, yet I have no doubt, but that, it is a depuratory process of the blood. An ancient man exclaimed (and well too) “I am fearfully, and wonderfully made!"

B. Deglutition.

The food, being thus prepared, then by an effort of the tongue, it is brought into the pharynx. The velum palatii, covering the posterior nares, thus preventing, a regurgitation, into nasal fossae.
Then an effort, of the Muscles, of the Pharynx, causes it to enter the Esophagus. The Trachea, being closed temporarily, for its passage. Having gone thus far, the voluntary Muscles, have nothing farther to do with it. Neither is it subject to the will, but by its gravity, and the force of the involuntary Muscles, it finds its way through the Esophagus, or Cardiac orifice, into the Stomach.

14. Chymification. — The Stomach, into which the food has now passed, is a very important organ, in the animal economy. It is an enlargement of the alimentary Canal, inviting the stay of food, until partially digested. It has two coats, viz. Peritoneal or External; Muscular having fibres running longitudinally, also circularly, and obliquely. Next to this, is the Vascular coat, being well supplied with blood vessels, and nerves. And in this coat, are the Gastric glands. The inner coat, is a thinner one, and when the Stomach is empty, it lies folded in folds, through the coat.
gastric faculties penetrate, to empty the gastric juice.

Above the stomach is the diaphragm, in the right hypochondriac region is the liver. In the left, is the spleen. Posteriorly, is the pancreas, connected to it, by a duplication, of the peritoneum, so also, is the spleen connected. And inferiorly, to the pyloric office, and duodenum.

Thus the stomach, presents itself, as an organ of importance, situated, at a point, most suitable for performance of the high function of digestion. It is in the midst of warmth and protection.

The food entering, while the stomach, is not extended, is received, into the invagination, of the mucous coat, and by actual contact, with the pith of small filaments, of nerves, belonging to the gastric glands. At once gastric secretion is induced, as has been seen, by Dr. Beaumont, in his case, which offered, such uncommon facilities of research. This juice, being secreted, in all parts of the
Tumach, it trickles down to the most pendent part, and surrounds the food. And now commences, chymification (one part of digestion.) It is a chemical process.

There is existing, in the saliva, and gastric juice, proportions of acid, and alkali, with other things. These having affinity, one for another, and for certain properties of the food, hence it is decomposed, and new compounds are formed. Often leaving, some single gas, having no affinity for the new compound, to escape, as a flat. And it is well, we are allowed, to get clear of it, for it might frequently prove unwholesome.

In the course, of a few hours, this chemical compounding is complete, and the result, is a thoroughly masticated, and partially digested substance, which is chyme. And being thick, and truly pre-judged it knocks, at the pyloric door, for the further lights of—

The Chymification— Before entering
The duodenum, the food, passes around and around, in the stomach, giving off, at each round, that portion which is thoroughly chymified. The pyloric guards well, lest that which is improperly should pass.

During chymification, there is just enough gastric juice secreted, to digest a sufficiency of food, to supply the wants of the system. Hence one of the evils of gluttony, in imperfect digestion, with its train of consequences.

The par vagum nerve, which seems to reign as vicegerent, over the function of digestion, makes known to the brain, when a sufficiency of food taken. And unless by indulgence, this medium is perverted, the knowledge conveyed by it is ordinarily correct.

The food having entered into the duodenum, for chylification (a further process of digestion), it becomes us to consider, the structure of the duodenum, and its relations to the surrounding...
Viscera, which aid in the formation of chyle.

The duodenum is the first division of the intestine, and is about twelve inches long, as its name indicates. It has three coats, but the mucous coat, differs from the mucous coat of the stomach, in having circular folds, called valvula-converentes, thickly set, instead of vague. These are for the purposes of retaining, and accommodating the food with the secretion of the glands of Brunner, (which glands are in these folds). And also, with the bile, and pancreatic juice, which are poured into the duodenum, four inches below the pylons. And below this, there are a great many lacteals, and the retention of food, by this vascular structure, affords absorbing facilities, by lengthening the stay of the food, and admitting more lacteals, from the enlargement of the space.

The pancreas, as before stated, is situated posterior to the stomach and is connected with it, by peritoneum. This is a large conglomerate
Gland, being several inches in length, in its centre, runs its duct, made up of small transverse ducts, from all parts of the gland. This longitudinal, or large duct, is continued to the duodenum, at the point, before mentioned. And the juice it conveys, is secreted, from the blood, and in a degree, dilutes it. This juice, being in the duodenum, it seems to be alone, for purposes of digestion.

The Liver, in the right hypochondriacum, is also, a conglomerate gland. And is much the largest gland, in the economy. It is divided into right and left lobes, by its umbilical fissure, the right lobe, is much the larger. It also has anterior, and posterior, surface, or superior, and inferior. The superior surface, is smooth, only marked by the umbilical fissure, and false form of ligament. The inferior, is not so smooth, but has the gall bladder, and transverse fissure. The whole gland is enveloped, in peritoneum, making a shining coat, upon its exterior.
This gland is peculiar, in having three sets of blood vessels, viz. **Vena Portae**, **Hepatic arteries**, and **Hepatic veins**. The **Vena Portae**, enters the liver, in its transverse fissure, and ramifies minutely, in the whole gland. The **Hepatic artery** ramifies in connection with, and is most probably, a source of nutriment, to the wall, of the **Pancreas**.

The **Pancreas**, is made up, by veins, from most of the abdominal viscera, hence, these veins, do not enter the **Vena Cava**. Ascendens, but come together to form this large vein, from the Minutiae, of this vein, the accompanying **Hepatic artery**, is secreted by small cells. The bile, which is conveyed, by many small ducts, into the great hepatic duct, and then the hepatic bile, is conveyed to the **Duodenum**. And when there is a surplus, it regurgitates, and is stored, in the **Spleen**, for cases of emergency. And I think it is probable, that the **Cystic bile**, undergoes more or less modification, and that a small proportion of it is always required for digestion, as well as **Hepatic**.
Hence for Chylification, a small portion passes the
gall duct, into hepatic, thence into duodenum, for its
office, in the digestive processes.

The properties of Bile, are Bicarb. Soluble, Various Phosphates, &c. It is yellowish, or greenish,
and bitter, and Alkali predominates.

That it aids in digestion when in the duodenum,
does not admit of doubt, but it is partly excre-
ted, and it is increment, that gives the nat-
ural color, to the feces.

Galen supposed the liver to have a great deal to
do in digestion. In despiration of blood, and that.
it sent its seum to the duodenum, its ports, to the
spleen, and its pure wine, to the heart. Thus making
it a mighty monarch, reigning over many provin-
ces. This theory was not molested, for many cen-
turies. It was thought to be firm as the unshaken
bluffs of Gibraltar, and likely ever to stand.

But at length, almost every province, was ta-
ken away, leaving it as a gland, secreting only a
The liver, altogether unmentionable, and worthless, but
at least, a medium ground, has obtained, and many
of its undoubted rights, has been restored to it,

I look upon the liver, and The Portal Circula-
tion, as highly important, in Nutrition, and digestion.
1st. It secretes a hepatic bile, for ordinary purposes,
of digestion. And a cystic, is always in store, for
Cases of emergency, as well as, its aids ordinarily, since
at no time, need digestion, be unnecessarily stayed,
even though perchance, there is a deficiency of hepatic.

2d. By this secretion, it dilutes, The Blood, and
fits it, for the important functions, of Nutrition.

This dilution, by secretion of bile, is quite neces-
sary, for when there is no secretion, a jaundice
is the result, from which state, there is not many,
more unpleasant, and depressing, to the system.

The Diaper of jaundice, shows the presence of a sur-
ples of Carbon, and a deficiency of oxygen. The com-
posed of bile, with Carbo, is evident, and this is the
compound, by The secretion of bile, leaving The Carbon
To escape by respiration, and this is a more perfect oxygenation. If this failure of secretion occur, then the blood containing the bile, in its regular round of circulation, brings the particles of bile to the cutaneous capillaries, hence the yellowish appearance, of Culis in jaundice. These particles of bile, in capillaries, retard circulation, and cut off the usual supply of oxygen, hence they by this means cause stuporidity. They were better secretion, entirely cut off, an increasing jaundice would follow, and life thus depressed would soon wane away, and be entombed in the cold shades of death.

Then with these views, we discover the liver and portal vein of chief importance, both of matters of digestion, and general circulation, and through these to nutrition.

The Spleen has been thought by some Physiologist, to have much to do in digestion. I confess I know but little about its physiology.
in this respect. But experiment has demonstrated, it as not being a vital organ, as it has been excised, and yet the person lived. But that it is important, in the economy, its presence is prima facie evidence, and further evidence exists, in the fact that the divine creator, deals in no superfluitas, but has made all organs for special use.

It probably serves more uses, than physiologist are aware, and there is room for new discoveries, concerning its office. And he that demonstrates, its entire office, will have a name for many years, in the literature, of the profession.

Galen thought that the spleen, was the receptacle of the excess of the liver,

Hick thought, it a reservoir, for the blood to prevent congestion of the vital organs.

Professor Rowling thinks, that when malady, is inactive in the body, it is driven, in the spleen, henceague cachex, and other splenic affections.

These ideas, are all probably true, but are not
fully demonstrated, as yet, though quite plausible. It is also thought, the spleen, has something to do in elaborating the contents of the thoracic duct, as it passes from the receptaculum chyli, to be pressed into the circulation.

With these remarks, we shall return, for the present, to pancreas, liver, aorta, spleen, and return through the pancreatic, and hepatic ducts, into the bloodstream, for there is no splenic duct, leading that way.

Upon return, we find, that by means of the pancreas, of glands of the stomach, and pancreas, with the aid of the bile, from the liver, that the chyme, during our absence, of exploration, has slowly changed itself, into chyle. These chyle, which is to be eliminated, per acutum. And this chyle is really, for absorption, by the intestines. Thus aiding to digestion.

Thirdly, Formation of Blood, by Absorption. So long as the aliment, in the intestinal canal, it
affords no nutrition, but in the vertebra there is a set of vessels, interposed, between the walls of the intestines, and the sanguiferous system, which are called lacteals. These receive the chyle and convey it to the thoracic duct, where it meets with the lymph, from the lymphatics, these having passed through the lymphatic glands, and the lacteals through the mesenteric glands, they both, by these glands, are more or less influenced, and fitted, for further use. The lacteal, with a portion of the lymphatics, empty into the receptaculum chyle. While the thoracic duct receives the intercostal lymphatics, and the duct from the glands of the right cervical region, and adjacent part, empty into the junction of subclavian and internal jugular, of the right side, thence into the circulation.

The lymphatics, are absorptive, coming from the skin, and all or most all, of the tissue of the body, passing as has been stated, through their
glance, and then pouring into the circulation, as has just been described. They are a part of the absorbent system, conveying from without, towards the intestines, or the circulation.

The lacteals arise, from a small cell, situated back of the epithelial coat of the bowel. Their office is, to take up the alimentary substance, after it is mixed with Pinniniis, pancreatic juice, and bile. Once this matter is not easily properly, unless absorbed, by the lacteals.

That the capillary vessels, in their minute ramifications, absorb a portion of the alimentory contents, seems to be certain. And in the invertebrate, this is said to be the sole way of the entrance of nutrient into the blood. As there exists, no lacteal, nor thoracic duct, in that or uncertain.

The lymphatics take in many substances, from the skin, and by this means, affect the general system, for instance, water this absorb.
...ay thirst, and Medicine, when endemically applied, enter the system through them, and affect the nerves, intestinal canal, or circulation, as their nature, may incline them, (ie) if they be caustic, they purge if, sedative, they quiet the nerves, and circulation. By removal of the epidermic, or dead skin, their mouths are exposed. Hence a base is blistered, for endemic medication. When a medicinal effect is desired through this media, about three times, as much is applied as when taken, per mouth.

These absorbents are constantly taking in from the surrounding elements, something for the support of the system, or in contagious, or malicious atmosphere, that which is derogatory to it.

When from dysphagia, the food cannot enter, the stomach, or when the ingesta will not remain on the stomach, when taken, in either of these cases, the lymphatics may arise from congestion, by letting the patient remain in a
Nutritious bath, as one of milk, and water, warm; nutritive injections, per ano, may materially aid, in such case.

The absorbing powers of the lymphatics are demonstrated, by applying madder to the skin, and then detecting it, in the color, of the urine. Also by external application of gallic acid, the experimenter, is enabled to detect it, in the urine also.

While garlic applied externally, effects the breath, showing that it is absorbed, and conveyed to the cells, of the lungs.

Saline medicines, endoscopically applied, are readily taken in, and when taken into the stomach, the tissues of the intestine, do not absorb them, but the capillary vessels, of the stomach, the pyloric extremity, of the stomach, might be injected, and yet a dose of Epsom salts, would purge, because it enters the circulation, and by its chemical union with the blood a portion of the serum, of the blood is cut off. Hence the philosophy of watery discharges.
Saline purgatives, is demonstrably shown.

The lymph, has less fatty matter, albumin, and fibrin, than Chyle, as it is not, so nutritious, as the Chyle, yet there is some resemblance, between the two. Lymph being in a degree nutritious, but a great deal of excrement, is thrown off from the system, by them. By the interstitial absorption performed by them, the disintegrated, and exhausted parts, are conveyed away, while all that is nutritious, in them is to remodelled, as to be again, taken into the circulation. And as this fact, has been demonstrated, we may adopt the language, of "Physician, who once said. "A sort of digestion is carried on, in all parts, of the body."

The office of the Lymphatic system, is to take up, and convey, to the circulation, such matter, as is nutritious, gotten by interstitial absorption, and such as is excrementitious, they convey out of the system, through the intestine. They also receive, from external elements, substances either nutriti-
tions, or elelterions, the quality being dependant on the nature of the surrounding elements. Thus they aid, in the nourishment, of the system, negatively, and positively. Negatively, by removing the exquisi-
test atoms, and making room, for newly vitalized matter. Positively, by conveying the remaining nutrient, of these disintegrated parts, again in-
to the circulation, and by receiving from extr-
ternal sources, nutrient substances, and Con-
veying them, likewise, into the circulation, they are, of great importance, to the system, as is thus shown. They will absorb, almost anything, which comes into their way, and in this, they dif-
fer from the lacteal, for they take up nothing false, that which is nutritive, generally.

The chyle, and lymph, being poured together,
into the thoracic duct, are further elaborated by
the convolutions, of the duct, and its bifurcations, al-
do by the influence of spleen, renal capsule, thymus,
and thyroid gland, all of which, have been sup-
posed to depurate it, fitting it well, for nutrition.

This admixture enters, at the juncture of sub-
clavian, and internal jugular veins, on left side.
Thence through vena innominata, to vena cava de-
scendens, and then in to the right auricle of
the heart, while the lymph, from the right side,
enters as before stated. The receptaculum-
chyle, to situate at inferior of dorsal, and supe-
rior portion, of lumber region, from thence.
The thoracic duct ascends, on the right side of vena-
cesta, and empties, as just specified.

The blood of vena cava ascendens, differs con-
siderably, from that of vena cava ascendens, which
it meets, in the right auricle. First because, it has
none of the fresh mixture of chyle, and secremen-
tious matter, of lymphatics, from the thoracic,
and superior lymphatic ducts. Secondly because
the liver, has greatly elaborated, that part which
passed the portal circulation, by secreting from it
the bile, and probably conferring upon it some new
properties. These two portions of blood, so different, are mixed in the right auricle of the heart and right ventricle, and are thus ready to enter into the pulmonic circulation.

Fourthly, Circulation and Nutrition.

The blood having been spent, in a good degree, by its previous systemic round, it is replenished, as stated above, and we find it, in the right auricle, ready for circulation.

And first, by an intuitive principle, existing in the heart, aided by the stimulating presence of blood filling the auricle, the fibres contract, and expel the blood, it passing through, the auricular-ventricular opening, immediately, the tricuspid valves close, to prevent the regurgitation of blood, and now, by aid of Columnae Carinae, the blood is further mixed, when again contraction takes place, and it is forced into the pulmonic openings, and the three semilunar valves close, with Corpus cavernosum, in their centre, to prevent regurgitation again.
And now by the vibrations of the heart, caused by its ventricular contraction, the blood is conveyed to the capillaries of the lungs, which are in juxtaposition, with the minute air-cells, being partially emptied by a previous expiration, admit of the escape of the surplus of carbon, into their cavities, which is cast off at the next expiration. And by inspiration, oxygen is received, and it having great affinity for the blood, passes through thin cells, into the cavity of the capillaries, and forms a compound, with it, making the arterialized blood.

Or again, the escape of the carbon, may be effected, by elective affinity, in the blood, which has such fondness for oxygen, that immediately upon its coming into its presence, it rejects the carbon, following the previous systemic round, and expels it from the air-cells, and takes at once the oxygen, for oxygenating, and chlorinating itself, and the system generally.

The oxygenization being completed, the blood hastens to return to the heart, through the media, of four
Pulmonary veins, carrying arterialized blood, then enter, the left auricle, on opposite parietes, two veins each side, this auricle being full, it contracts, and the blood passes, the auriculo ventricular opening.

The Mitral close at once, to prevent the reflow into the auricle, the blood is now found in the left ventricle, the walls of which, is a line thick, and admits of powerful contraction, which soon takes place, forcing the blood, into the aortic opening, when semilunar values close, with corpora aurantia, in the centre again presenting, the return of blood.

The Sounds of the Heart (1st and 2d) are said to be produced, by the synchronous contraction, of the ventricles, for 1st. And regurgitation, of blood against the semilunar values 2d. They are similar, to the pronunciation, of the following monodylaudes, reciting the first, with some emphasis, Lale, "The contractions, and their sounds, being done, we find the blood in the aorta (2/3 of each contraction) abounding with oxygen, and nutrient, in person,
of the protein compounds. This calorificized, and nu-
trient fluid, passes through the arteries, with speed,
and we might say, bounding with delight, to the
arterial Minutiae, of the body, to the needful warmth,
and Nourishment.

The arterial Circulation, is carried on, by the
vis-à-visage, of the heart, and elasticity, and Contra-
tility, of the arteries,

Just after passing, the semilunar valves, the
Coronary artery is given off, for the Supply, of nutri-
tion, to the Muscles of the heart. And after minute
pamification, the Blood is returned by coronary
veins, through the valve of Thucius, to the right aur-
cicle. Then on the arch of the aorta, the arteria
innominate, is given off, which is up to 1 inch in
length, and it divides, into right subclavian,
and Carotid. The subclavian arches up, beneath the
Clavicle, hence down into the axillary region,
giving off, Mammary arteries, &c. Thence it becomes
Brachial, and ramifies through the various tissues.
of the arm, and forearm, and hand. Not in course, to give off, the left subclavian and left primitive carotid. This subclavian, passes (with some slight variations) as the other, on the opposite side, and gives nutrient to the left axillary space, arm, forearm, and hand.

The primitive carotids, pass alike, under the clavicles, and at a point, opposite the superior margin of the hyoid cartilage. They each bifurcate, and these bifurcations, are called external, and internal carotids. One of these branches, goes to nourish the soft parts outside, of the cranium, and facial bones. The other entering through the carotid foramen, on either side, of the skull, subcutaneous, and ramifications through various parts of the intercranial substance. In fact, thereby are, of the vertebral arteries (which becomes basilar, after it enters at foramen magnum), supply nutrient to the brain and its meninges. Then by means of the external and internal jugular,
veins, and the vertebral vein, the blood is conveyed back again, into the Vena Cava descenens, receiv-
ing the contents of the thoracic duct, by the way then emptying, into the heart.

The aorta, by its curvature, takes a down-
ward course, on the anterior portion of the ver-
terbral Column, giving of the intercostal, gastric, Splenic, Renal, Mesenteric, and Spermatic art-
eries, and probably a few others, which allege,
to their respective organs. And their returning
vein, go to make up the Vena Postrema, unless it
be the Spermatic, of this vein. Now, not certain,

Opposite the Lumbar Vertebra, the aorta bi-
furcates, into Common Illiees, then their eliviea,
making internal, and external Illiees. The inter-
mal, gives nutriment, to the Gluteal region.

partly, and around about, the organs of gene-
ration, and mostly supply these organs. The
external, passes beneath the Pauports ligament,
and then becomes the femoral artery. About
Two inches below, popliteal ligament, the popliteal artery is given off, which runs through the femoral muscular structure. The femoral passes beneath the sartorius muscle, and through the fascia of Longus Magnus, into the popliteal space, and it is then called popliteal artery.

After this it divides, into various branches, to supply the tissues, of the leg, and foot, and then passing the capillaries, the blood enters the venous circulation. The blood now returns to the heart, through veins, they having valves, and in this effering arteries, which have none, and at their juncture, with the heart.

The venous circulation is accomplished by aid of valves, and balance of power, received from the arterial tubes, with a force given, in the capillaries, by absorption of the nutritive particulars, for use of the adjacent tissues. And last, but not least, is The acid, given by muscular contraction, as a cause of venous circulation.
is exemplified by the fact that much muscular exercise greatly increases circulation. And familiar illustration is seen in venesection, when by the muscles, and tendons a staff is grasped, by the contraction the blood tends to flow much faster. This is incontestable evidence of the aia, given to venous circulation, muscular contractility. By all these means we find the blood of Vena Cava's ascending, and descending, again in the right auricle, and it, ready to contract, to commence again. The Pulmonic circulation arrives as the Systemic, there is about three pulmonic rounds, to one systemic.

But a query now quite arises. What has been done all this round of absorption, excretion, and circulation? We have that the great vital processes of Nutrition, has taken place, and excreta, fition matter, has been eliminated through tracts, of Bowels, Skin, Respiration, and kidneys, and their appendages, but again the query—How are these processes of excretion and Nutrition accomplished?
Ans.—The blood in its normal state is fraught with nutriment in person of the protein compounds, of albumen, casein, and fibrin, &c. Nutriment enters the body, to give out its nutriment, unless perchance, it be in some cases, of nutriment to nerves, when it enters them directly, without entering first, into the circulation. This is a mooted point, to my mind.

Now the question:—What is nutrition? Ans.—It is the process by which waste places, of the several organs, are renewed, and development and growth of the body is maintained. Digestion, absorption, concretification, circulation, secretion, and respiration, all, are but links, of the beautifully complicated chain, of nutrition. This, we have anticipated in the divisions, of our subject.

The human body, is as a machine receiving motory power, by food through the blood. And there is a continued removal of exhausted atoms, by the lymphatics, and simultaneously, there is a filling up, of the vacated space, by deposits from capillaries.
Every organ in the body is possessed of an elective faculty, by which it imbibes, from the capillaries, that which is suited to its own composition and use.

Thus the muscles select, mostly, from the protein of fabric, while the bones, composed of carbonate and phosphate of lime, received, mostly, a gelatinous substance. And cartilage, synovial capsules, mucous membranes, portion, as suit for their recombination. And this is resilient, a vital principle worthy of its Creator!

Know that it is so, but who, who can fathom and tell of its moving agency? How is it? Can a man tell how, while yet, in utero, changes are going on, growth maintained, and decay comes not? Or why in old age, decay superabounds, and the once erect, once healthy posture, is now bent in serpents, and decrepitudes? We know that it is, because in the first instance, there is more deposited by lacteals, than is taken away, by lymphatics,
Here growth, as by this, new celes are made to spring up, and man, who is componde of conglomerated labyrinthian cells, in thers, by the superaboundy aspect of Nutrition, eventually grows to his full stature, when the waves of Nutrition (thus to speak) are stayed! Why are not all men, as small as Tom Thumb, or as large, as the Sons of Adam? For God, that givens the stature, and we can neither add a cubit thereto, nor make a single hair, white, or black!

Here at his grown stature man stands permanantly, till by the blasting of disease, or approach of age, when the syphaticus presents, and sooner, or later, the suns into the cold vault, of the grave! And to God, who is the Beach, against which the billows of Nutrition break, and recede through the painted declivities, of time into the Matrix of Eternity, the Tomb! How interesting these thoughts!

While all this we know, still naught we know perfectly! Why have crystals, a peculiar shape, or shapes?
Why do trees grow erect? Why do children resemble parents in color, features? Why is man, who is changing the particles of his composition, every hour, till one year, resembling, and really, the same, in few years, that he was the year previous? These are such as that vital principle, of which we have been speaking, and we can answer them, only by saying, they are laws of God!

But again, some food is not capable of digestion, and hence, not nutritious. This with the waste of the body, is excrementitious substance. And by means of the peristaltic motion of intestines, and eliminating qualities, of the glands of Peyer, the excrement of the bowels, and liver, thrown off. While the kidney secret and cast off, the urine acid, and from the esophagus, par- spiratory tube, of the stomach, perspirable excrement to pass out. The sebaceous glands cast out organic matter, as a lubricant, and excrement. And the carbon generated by the decay of parts in every organ is eliminated, by expiration, how wisely arranged!
How fearful is man complicated, and yet how de- 
railed! How beautiful once was man, but alas, he has fell
en! But worthy is Thy Name, O Jesus, oh Lord, for Thou
didst Make Man in Thine Image! And though fallen, the
Ist Physiology is beautiful!

But again—how unseemly is the ill-favoured silkworm,
or the caterpillar, whose appearance is forbidding, but
a few hour, or day, or toil, wraps them up, in their sick-
en nest, until the bitter blasts of winter are
flowen; and when the genial,ernal rays, strips
the earth, of her white garments, of winter, and
cloths her, in embroidery of spring, then it is
that these, unseemly worms, come forth. The beauty
of beauties, and instead, of their former snail-like
motion, they now unshackled, plane their wings,
and joyfully fly away, reflecting beautifully the
sun's rays, and in dazzling splendor, as they are
wrought, on the gentle summer's Breeze!

And now, by analogy, man, is the worm toil-
ing, for the silken nest. And if in his tommo-

Condition, his physiology, be so beautiful and complicated, how inconceivably glorious, will he be.

Who gains his self-esteem, in which to pass the present grave, while long around him, lingers, the chilly winds, of death!

Ah! me, when at the Arch Angel's bidding, he plumes his wings, and flies from the wintry main, away, to his eternal home! How beautiful then! And when in that world, all patient with light, uniting, from the Divine Throne, and him, Their Light, Their Light, Amia the light from encompassing flowers of bliss, to bliss flowers encompassing, how gladly will he fly, while the rays of light, in their angle of incidence, will fill his soul, with everlasting peace, and in their reflection, give glory to God!

Oh! then, how beautiful will be the physiology of Nutrition, in Sainted Man!